Management Indicator Species for the New Plan

Success in maintaining and restoring composition, structure, and function of forest ecosystems within desired ranges of variability is reflected by both changes in forest condition and by levels of management and other effects that are shaping these communities. Monitoring will include tracking the abundance of major forest cover/community types and levels of management activities conducted to maintain and restore desired conditions. Population trends and habitats of Management Indicator Species will be monitored to help indicate effects of national forest management within selected communities.

Indicator: Pine Warbler (*Dendroica pinus*)

From USGS Patuxent Bird ID InfoCenter

Reasons for Selection: The pine warbler is closely associated with pine and pine-oak forests, generally occurring only where some pine component is present. It therefore is an appropriate indicator of the effects of management in restoring and maintaining pine forests.

Ecology & Life History

Basic Description: A 14-cm-long bird (warbler).

General Description: Slightly larger than most other wood warblers (13-14 cm length, 9.4-15.1 g). Adult males have un-streaked, olive-green upper parts, a yellow throat and breast with indistinct black streaking on sides of the breast, a white belly and under tail coverts, dark wings with faint bluish tinge, and two broad whitish wing-bars. Adult females are duller and variable, but always with browner or grayer upper parts, a paler yellow throat and breast, duller white belly

and under tail coverts. Bill is black and relatively heavy for a warbler. Immature is like adult female, but brownish gray above, breast, belly, and under tail coverts are washed with buff. Juvenile has grayish brown head and upper parts; grayish under parts are washed with buff on breast, belly, under tail coverts, and wing bars (Rodewald et al., in press).

Diagnostic Characteristics: Bay-breasted warbler (DENDROICA CASTANEA) and blackpoll warbler (D. STRIATA) in winter plumage are sometimes confused with the pine warblers. Pine warblers differ from those species in having a heavier-bodied and larger-billed appearance, un-streaked upper parts, a darker face contrasting with paler throat, a longer tail, and narrow and duller edgings on tertials. In addition, pine warblers typically show a pale yellowish or grayish area extending up the sides of the neck, which contrasts with the slightly darker face. Pine warblers have dark legs and feet (adult blackpolls usually have yellowish to pinkish legs) and are usually darker green in upper parts than are bay-breasted warblers.

Reproduction Comments: Perhaps due to the usual nesting high in trees, there are little data on reproduction. Breeding territories are established from late winter in the south to spring farther north. Breeding can begin in early-March in deep southern populations, later in the north, and may extend to early August. Based on 226 clutches from throughout the range, McNair (1987) reported a mean clutch initiation date of 20 April +/- 25 days (standard deviation). Median initiation date was 12 April; clutches were initiated between 7 March and 7 July. During an early spring in Georgia, one unfinished nest was found on 17 February (Burleigh 1958); however, most nest building does not begin until March in southern states. In more northerly states, nesting begins in April, May, or early June.

Males establish territories through persistent singing, continuous presence, and chasing or attacking intruding birds. Fights and chases among males become less common as season progresses, at which time males seem to maintain territories primarily through singing.

Clutch size is three to five (usually four). Although it is widely mentioned that the species is double-brooded, and even triple-brooded (Potter et al. 1980), there are no data to support those claims. It is almost certain the species can raise more than one brood per year, especially in southern states. Incubation, primarily by the female (male occasionally assists), lasts 12-13 days. Males feed the female on the nest. Young are fed by both parents during nestling and fledgling stages. The period of time parents feed young after fledging is unknown. Birds reach sexual maturity within one year.

Ecology Comments

Various population density figures have been reported in the literature. In Georgia, Johnston and Odum (1956) recorded 0.4 territorial males per ha in 25-year-old pine forest, 0.85 males per ha in 35-year-old forest, 1.06 males per ha in 60-year-old forest, and 1.36 males per ha in 100-year-old forest. In Texas, Dickson and Segelquist (1979) reported 0.2 territorial males per ha in pine-hardwood sapling stands, 0.55 males per ha in pine pole stands, 0.35 males per ha in pine-hardwood pole stands, 0.50 males per ha in pine saw timber stands, and 0.20 males per ha in pine-hardwood stands. In pine plantations in southern Illinois, where the species is far less common, Graber et al. (1983) reported 2.2 males per 40.5 ha. In Maryland, Stewart and Robbins (1952) recorded breeding densities of 1.9 territorial males per ha in an immature loblolly-shortleaf pine forest, 0.5 males per ha in pine-oak forest (pitch and Virginia pines, and southern red oak (QUERCUS FALCATA), and 0.25 males per ha in a mature Virginia pine forest.

Winter bird count data from the Archbold Biological Station in central Florida (December 1993), indicate a density of approximately 2.35 birds per ha (J. Fitzpatrick, in litt.). In winter, it can be abundant in pine forests of the southeast where large mixed-species flocks may contain 50-100 or more pine warblers. In fall and winter, mixed-species flocks in southeastern pine forests usually form around Carolina chickadees (POECILE CAROLINENSIS) and tufted titmice (BAEOLOPHUS BICOLOR), and often include woodpeckers, brown-headed nuthatch (SITTA PUSILLA), eastern bluebird (SIALIUS SIALIA), kinglets (REGULUS spp.), and, farther south, blue-gray gnatcatcher (POLIOPTILA CAERULEA), blue-headed vireo (VIREO SOLITARIUS), yellow-rumped (DENDROICA CORONATA) and other warblers, and chipping sparrow (SPIZELLA PASSERINA) (Gaddis 1983, Morse 1970). Warblers in fall and winter flocks can be notoriously aggressive, with males frequently fighting, chasing, or supplanting other males and females (Morse 1974). Winter mixed-species flocks in north-central Florida contained pine warblers 65% of the time and had a mean of 2.6 individuals per flock (+ or - 1.8 SE) (Gaddis 1983).

There are few data on territory size, but size probably varies considerably depending on habitat quality. In pine-oak forest in northwestern Arkansas, two pairs held territories approximately 1.0 ha in size (Rodewald, pers. obs.). Howe (1979) observed a pair in Minnesota nest building on a 0.1-ha lake island located 450 m from shore, indicating territories can be quite small in some cases. However, warblers were more regularly recorded on 1.0-ha lake islands. In oak-pine forests with low percentages of pines, may utilize only a small proportion of a much larger territory, typically moving from pine tree to pine tree and passing over deciduous trees (Morse 1974).

Inter-specifically aggressive towards many bird species, especially yellow-throated warblers (D. DOMINICA) during the breeding season on Delmarva Peninsula in Maryland. Pine warblers typically prevail in aggressive encounters, and were even recorded displaying towards and counter singing with yellow-

throated warblers (Ficken et al. 1968, Morse 1974). Aggressive behavior towards yellow-throated warblers has also been noted in northwestern Arkansas (Rodewald, pers. obs.). Brown-headed nuthatches flocking with pine warblers in Louisiana foraged heavily on distal parts of limbs and twigs, whereas warblers foraged in areas near tree trunks. In the absence of one another, the two species exhibited similar foraging distributions, indicating that each has an influence on the foraging behavior of the other (Morse 1967).

Individuals wintering in southern forests are susceptible to extremes in weather and temperature. After 5 inches of snow and near-zero temperatures in coastal South Carolina in February 1899, Wayne (1899) reported finding countless dead birds of 16 species, including many pine warblers, a species he described as "decimated" by the cold.

Non-Migrant: Y

Locally Migrant: Y

Long Distance Migrant: Y

Migration Comments: Migratory in the northern half of the range. In subspecies PINUS, spring migration occurs primarily from late February to mid-May. Fall migration begins in September in northern populations, with the majority of migration occurring in October. Birds in some southern populations may not migrate.

Terrestrial Habitat(s): FOREST - CONIFER, FOREST - MIXED, WOODLAND - CONIFER, WOODLAND – MIXED.

Habitat Comments: Strongly associated with presence of pine and pine-hardwood forest during the breeding and winter seasons. A common breeder in most pine forests of the southeastern United States and in areas with pines in southeast Canada and the northeastern United States, but usually at lower densities, less common as a breeder in white pine forest areas. The highest numbers seem to occur where pure stands of pine are found; less abundant as the proportion of hardwood tree species increases. Birds are rarely found in deciduous forest, scrub, and thickets, except during migration and winter.

Breeding occurs in a wide variety of pine forest types but not in other conifer forests (e.g., spruce (PICEA spp.), fir (ABIES spp.), larch (LARIX spp.), or hemlock (TSUGA spp.). In the north-central and northeastern U.S. and Canadian provinces, breeding occurs in stands of red (PINUS RESINOSA), pitch (P. RIGIDA), jack (P. BANKSIANA) and white (P. STROBUS) pines (white pine also being used in the Appalachians). In southern states, breeding and winter habitat consists of stands of shortleaf (P. ECHINATA), longleaf (P. PALUSTRIS), loblolly (P. TAEDA), Virginia (P. VIRGINIANA), and slash (P. ELLIOTTII) pines.

Breeding occurs less frequently in sand (P. CLAUSA) (Stevenson and Anderson 1994) and pond pines (P. SEROTINA) (Schroeder 1985) in the southeastern U.S. All forest types used may be mixed with varying proportions of hardwood species. Nesting may occur in areas of primarily deciduous forest where small groves of pines are present. Adapts well to pine plantations, which are used for breeding throughout the range. In Florida, Repenning and Labisky (1985) did not record breeding warblers in 1-, 10-, and 24-year-old slash pine plantations, but recorded 8 birds per sq km in 40-year-old plantation forests. However, they found that the species did use 1-year-old (3 birds per sq km), 24-year-old (20 birds per sq km), and 40-year-old (86 birds per sq km) pine plantations during winter.

In winter, birds commonly forage in large mixed-species flocks in southern pine forests when numbers increase because of birds migrating from farther north. At that time, flocks may forage in forest leaf litter, or in fields and pastures, usually in the vicinity of forest edge.

Density of pine warblers is inversely related to percent of deciduous vegetation within a stand (Schroeder 1985). In a breeding habitat suitability model developed by Schroeder (1985), three main habitat variables of importance were identified: percent tree canopy closure (excluding white, sand, and pond pines), successional stage of the stand, and percent of dominant canopy pines with deciduous under story in the upper one-third layer. Optimal nesting habitat was provided by pure, dense, mature pine stands (excluding pine species mentioned above) that lack a tall deciduous under story. One shortcoming of this model, however, is that warblers do use white pine forest types for nesting; they simply tend to be less common in those pine habitats.

Conner et al. (1983) reported that mature pine forests were favored in east Texas, with increasing abundance as the proportion of pole-size pines and vegetation height increased. Tree and shrub species diversity, and foliage density at different heights had little effect. In addition, stands of sapling-sized pines were avoided.

In eastern Tennessee, Anderson and Shugart (1974) found that distribution was influenced by several habitat variables, the strongest of which was related to average size of under story vegetation, number of canopy trees, and average size of canopy vegetation. In this area, birds selected areas with sparse under story and a dense canopy. In the Ouachita Mountains of Arkansas, Wilson et al. (1995) found significantly higher densities in forests with a more open mid-story, lower canopy coverage, lower basal area of conifers and hardwoods, and dense ground cover of grasses, shrubs, vines, and forbs.

Nesting occurs typically in pine trees in forest, rarely in deciduous trees within pine forest. Nests usually are placed on a horizontal branch or among foliage at

a branch tip, usually 8-20 m above ground. Nests are usually well hidden and difficult to observe from the ground.

Food Habits: FRUGIVORE, GRANIVORE, INVERTIVORE

Citation: NatureServe Explorer: An online encyclopedia of life [web application]. 2002. Version 1.6, Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer. (Accessed: May 15, 2003).